Directed in vitro myogenesis of human embryonic stem cells and their in vivo engraftment.

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Funding Grants: A Novel Microenvironment-Mediated Functional Skeletal Muscle from Human Embryonic Stem Cells and their In Vivo Engraftment, Development of Synthetic Microenvironments for Stem Cell Growth and Differentiation

Public Summary:
The article discuss a methodology to derived myogenic progenitor cells form human pluripotent stem cells without genetic manipulation. The hESC-derived cells underwent myogenic differentiation in vitro. When transplanted in vivo, these pre-myogenically committed cells were viable in tibialis anterior muscles 14 days post-implantation.

Scientific Abstract:
Development of human embryonic stem cell (hESC)-based therapy requires derivation of in vitro expandable cell populations that can readily differentiate to specified cell types and engraft upon transplantation. Here, we report that hESCs can differentiate into skeletal muscle cells without genetic manipulation. This is achieved through the isolation of cells expressing a mesodermal marker, platelet-derived growth factor receptor-alpha (PDGFRA), following embryoid body (EB) formation. The ESC-derived cells differentiated into myoblasts in vitro as evident by upregulation of various myogenic genes, irrespective of the presence of serum in the medium. This result is further corroborated by the presence of sarcomeric myosin and desmin, markers for terminally differentiated cells. When transplanted in vivo, these pre-myogenically committed cells were viable in tibialis anterior muscles 14 days post-implantation. These hESC-derived cells, which readily undergo myogenic differentiation in culture medium containing serum, could be a viable cell source for skeletal muscle repair and tissue engineering to ameliorate various muscle wasting diseases.